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ABSTRACT

Differences between comprehension of inductively presented material and of deductively presented materials as reflected by scores on multiple-choice and cloze tests of comprehension were sought using specifically constructed materials. The Logical Patterns Test was designed with a series of multiple-choice tests in one section and a series of cloze tests in another. Each section has a deductive and inductive part. Subjects, 33 college freshmen and sophomores, were given the test in two sessions. Data for the four subtests were analyzed using t-tests and correlation procedures. Significant differences were noted for presentation methods in both test types, the deductive passages being consistently more difficult. Examination of correlations among subtest scores revealed that multiple-choice tests appear to discriminate between comprehension of both presentation methods to a greater extent than do cloze tests. Tables and references are included. (MS)

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The Adequacy of the Cloze in Measuring Comprehension of Different Logical Patterns

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This study explores the extent to which multiple-choice and cloze tests agree in their measurement of comprehension of material presented in two logical patterns, induction and deduction.

Considerable effort has been expended over the last few years in validating the cloze technique of testing reading comprehension. This validation for the most part has compared students' performance on cloze tests with their performance on standardized reading tests, or in some instances, on prepared multiple-choice tests. Despite the doubts expressed by Weaver and Kingston (1963), the high relationships found in such studies as Culhane (1970), Rankin (1970) and Bormuth (1967) have generally been accepted to indicate that cloze tests approximate the general reading comprehension skill as measured in standardized tests.

RE 003 971

Weaver and Kingston, among others, have claimed that cloze testing actually samples a different type of reading behavior than does multiple-choice testing. Bormuth's response (Bormuth, 1969) was to present evidence of a general reading ability that is represented equally by constructed multiple-choice tests and cloze tests over five sub-skills. He was unable to identify on the basis of student comprehension scores any factors or skills that were separate from this general factor on either the cloze or multiple-choice tests.

This study is an attempt to look again at the assumption that cloze and multiple-choice tests equally reflect a general reading performance.

Although predictions are high, cloze tests do not, of course, predict exact performance on other reading tests. This difference in variance may well represent a strength or advantage to cloze testing rather than indication of lack of validity. It is on an intuitive level very tempting to view the cloze test, which requires close scrutiny of passages, as measuring some different processes, or skills than those measured by standardized multiple-choice tests.

There is a long history of frustration and difficulty in isolating specific reading skills for analysis or for instruction in the skill. Mosberg's work (Mosberg, 1969) is an interesting example of attempts to categorize knowledge in this area. A variety of categories of factors have been suggested, such as: those related to organizational pattern, linguistic units related to comprehension, following patterns of thinking which result in adequate analysis of material, and the relationship of cognitive development to specific aspects of reading performance. These attempts to characterize skills in reading have identified factors in the

structure and organization of the materials read, or in the structure and organization of the mental processes of the reader as factors in the comprehension process.

There is a particular subset of these factors which refer simultaneously to the structure of ideas in print and to the structure of particular cognitive skills. For example, reading for chronological or sequential order is an application of seriation skills; making a generalization from cause and effect sequence is a type of conditional reasoning. The ability by the reader to identify and follow these reasoning patterns may underlie other skills of comprehension such as those labeled "interpretation," "evaluation," and "analysis."

A pair of general skills which fall in this category are the reasoning skills of induction and deduction related to patterns of idea development in written materials. The primary questions asked in this study center on the relative ability of cloze and multiple-choice tests to measure a reader's ability to comprehend materials in these two logical patterns.

For this study, inductive reasoning is identified as the process of forming generalizations or drawing conclusions on the basis of facts, reasons or illustrations, by analogy, or through the use of comparison and contrast. An idea in print which presents a generalization by such evidence is identified as an inductive logical pattern. When this pattern appears in print, the generalization may either precede or follow the evidence. The logic in this type of reasoning is based on probability.

Deductive reasoning in this study is defined as a process of drawing conclusions on the basis of logical necessity, or in following a form that

implies such a conclusion. The forms of concern are the traditional syllogistic forms, mathematical reasoning, transpositional reasoning and conditional reasoning. As in the inductive pattern, natural language passages identified as deductive do not necessarily follow the formal order of discovery. In a paragraph or longer passage, the conclusion may well precede the logical evidence. The premises on which the conclusion is based then appear as details of the passage.

There is adequate evidence that these two patterns of reasoning exist and develop as unique abilities. Wetherick (1969a and 1969b) found inductive inference to be a general capacity separate from any specific content, and that this capacity develops in two stages. In the first stage the person learns to identify the subset of cues in common instances. In the second stage, the person learns to identify the subset of cues not present in other instances. He found this last skill to be acquired last in childhood and lost first in old age, implying to him that a short-term memory factor affects the second stage.

According to Kofsky (1966) learning the induction process, in Piagetian terms, is learning resemblance sorting, consistency in sorting, and exhaustive classification, while the deductive process develops through learning multiple class memberships, horizontal classification and hierarchical reclassification. Roberge (1970) also identifies deductive reasoning with the mental operations of class reasoning and conditional reasoning. He has illustrated developmental improvement in deductive reasoning over grades 4-10.

Although these patterns of reasoning are apparently different in form and development, there is little evidence to compare them in difficulty. Since class reasoning and conditional reasoning grow out of inductive ex-

perience, it may be assumed that deduction begins to develop after some inductive skills have been established.

It is assumed in this study that ability to follow these two logical patterns in written materials would be a skill related to successful reading comprehension. In fact, reading experts in their tests and other writings frequently refer to the need to develop skill in discriminating logical patterns. Jordan (1967), Karlin (1971) p. 229, Herber (1971).

Despite the importance of this skill, standardized tests provide minimum opportunity to evaluate student abilities in a range of these patterns. Table I presents an analysis of the provision for inductive and deductive reasoning in six well-known standardized reading tests. The reading passages in the comprehension portions of these tests have been designated as inductive or deductive. Narrative and descriptive material is included in the inductive category.

Table 1

Per Cent of Inductive and Deductive Passages and Related Questions in Six Standardized Reading Tests

Reading Test	Inductive		Deductive	
	Passages	Questions	Passages	Questions
Coop English, Form 1A	100	100	0	0
Diagnostic Reading Test: Survey Form B	83	94	17	6
Gates-McGinitie, Survey E. Form 1M	76	75	24	25
Iowa Silent Reading Test, Form Am	100	100	0	0
Nelson Denny Reading Test, Form A	100	100	0	0
Stanford Diagnostic Reading Test, Level I	68	78	32	22

An extremely high incidence of inductive items was found in these tests. Part of the difference found between results of cloze and multiple-choice testing may be due to skills, such as deductive reasoning, which are not sampled on standardized tests. In such a case, the cloze test with the possibility for selecting a wider range of patterns, may give a more adequate measure of this ability for an individual reader.

Hypotheses and Procedures

In general the purpose of this study is to discover is any difference between comprehension of material presented inductively and comprehension of material presented deductively is equally reflected by scores on multiple-choice and cloze tests.

Specifically, the following two null hypotheses are tested in the study.

1. There is no difference between comprehension scores of students reading materials identified as inductive and materials identified as deductive

    a. As measured by a multiple-choice test.
    b. As measured by a cloze test.

2. There is no difference between correlations found when comparing inductive and deductive scores from multiple-choice tests and those scores from cloze tests.

To test these hypotheses the test Comprehension of Logical Patterns, was given to 33 college freshmen and sophomores who were among those enrolled in a community college reading improvement program. Students in the program were advised to enroll on the basis of their scoring below the 40th percentile on the Diagnostic Reading Test.

The Logical Patterns Test, prepared especially for this study, is composed of two sections, one a series of multiple-choice tests and the other a series of cloze tests. Each section of the test is divided into two parts.

In one part the passages are presented inductively, and in the second part the passages follow a deductive pattern. These passages were selected from three different sources. Selections of approximately the same length were included in each part of the test from each of the three sources. The difficulty level of the passages was identified by the Fry scale as grade 10, grade 12 and college (difficult, near the end of the chart). Multiple-choice questions were constructed for the first two parts of the test. Each of the 40 items offered four foils, and required relating ideas in the passage.

The cloze tests appeared with every 5th word deleted and required exact replacement for correct responses. Special answer sheets were prepared for both the multiple-choice and cloze items. The test was administered in two sessions.

Figure I presents a design of the test which yields four subtest scores: MC-I, MC-D, Cloze-I, Cloze-D.

Figure I

Test I - Comprehension of Logical Patterns

	Multiple-Choice		Cloze	
	Inductive	Deductive	Inductive	Deductive
Sources	1 2 3	1 2 3	1 2 3	1 2 3
	1	2	3	4
Scores	MC-I	MC-D	Cloze-I	Cloze-D
	(20)	(20)	(139)	(145)

The data was analyzed by t-tests of the significance or difference between correlated means, and by comparing correlations in the matrix formed from the four test scores.

Results and Discussion

The first hypotheses requires a comparison of the difficulty students found in reading the two logical patterns. Table 2 presents the results of t-tests for the significance of difference between correlated means. These scores are expressed in per cent of correct responses.

Table 2

t-Tests of Difference Between Correlated Means on Multiple-Choice and Cloze Tests of Inductive and Deductive Passages

	Mean Per Cent Comprehension				
	Inductive		Deductive		
	s	$\bar{x}$	s	$\bar{x}$	
Multiple-Choice	13.04	51	12.05	45	2.2175[1]
Cloze	9.53	30	8.97	23	5.7423[2]

1 $p < .025$

2 $p < .001$

In relation to the accepted values of 75 per cent comprehension on multiple-choice and 40 per cent on cloze as levels of frustration, the passages on this test must be viewed as quite difficult for the students. The Inductive-deductive difference on both the multiple-choice and the cloze tests are large enough to be significant. The deductive passages are consistently more difficult.

Therefore, the hypothesis that there is no difference between comprehension of inductive and deductive passages must be rejected on the basis of scores from both tests. The somewhat larger difference found on the cloze

test implies that it may be more sensitive to differences in the difficulty students found in understanding inductive and deductive passages.

The second hypothesis requires a comparison of correlations among the subtest scores to determine if either test is more sensitive to individual differences among students in their ability to comprehend the two types of material. Table 3 presents the matrix of correlations found among the four test scores.

Table 3

Correlations Among Multiple-Choice and Cloze Subtests of Inductive and Deductive Comprehension

				Cloze-D
		2	3	4
1.	MC-I	.24	.40	.20
2.	MC-D		.55	.38
3.	Cloze-I			.80

In general these correlations fail to reflect the degree of relationship expected between tests of the same form or pattern. Beyond the possibility of low test reliability, these lower correlations may be due to the fact that each of the subtests differ from each other in at least one dimension, pattern or test form, and two of them differ in both dimensions.

When test form is held constant, the cloze test correlates highest across the two patterns, with a correlation of .80. On the multiple-choice tests the correlation is .24. The two tests did not produce similar correlations between scores on inductive and scores on deductive materials. The

relatively high correlation of .80 shows a strong relationship between comprehension of the two logical patterns when measured on the cloze test. But when measured by multiple choice items, the correlation .24, does not reach a level beyond chance. In spite of the necessary reservations due to test reliability and item validity, it seems that multiple-choice tests, prepared for that purpose, do discriminate between student's comprehension of inductive and deductive patterns to a greater extent than do cloze tests.

Therefore, the hypothesis that there is no difference between the correlations found when comparing inductive and deductive scores on the two tests must be rejected.

Conclusions

In this study the scores from a multiple-choice test prepared to measure comprehension of inductive and deductive logical patterns were compared to scores from cloze tests of the same patterns. Results on both tests indicated that the deductive patterns were significantly more difficult to understand than were the inductive passages. Also, the low correlation found on the multiple-choice test between comprehension of deductive and inductive patterns, compared to the high correlation of the two skills on the cloze tests, suggests that the multiple-choice tests prepared to measure comprehension of these patterns does a better job of discriminating differences in an individual reader's ability in the two areas.

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